# Activity 2.4 Which effects can acids have on different materials and on our health? – Not intended effects10

## 2.4.1 Effect of acid on bones

### Apparatus and materials

1 large test tube (Ø 3 cm)

decalcifying agent, e.g. citric acid solution or decalcifying substance as bought in the store

long and thin bone from chicken, duck or goose; cleaned

### Safety

Observe all safety measures regarding the handling of acids! Wear your safety goggles!

### Procedure

Put the bone in a test tube and add enough decalcifying solution to completely cover the bone.

In case the bone does not stay submerged, you can hold it in place by covering the test tube with a (pierced!) stopper.

Leave the test tube sit for several days according to the bone’s thickness, renewing the solution every day.

### Disposal

After diluting, pour the solutions down the sink. Put the solids in the waste bin.

10 Source (adapted from):

<http://sinus-transfer.uni-bayreuth.de/fileadmin/MaterialienBT/Skript_Flint.pdf>

## 2.4.2 Closer investigation of the products of the reaction between marble (chalk) and acids11

### Apparatus and materials

1 test tube for each acidic solution to be analysed

matching pierced stoppers

fermentation locks, one for each test tube

spoon

glas stirring rod

crucible tongs

gas burner

various acidic solutions to be analysed

very small pieces of marble (or limestone pieces)

calcium hydroxide solution

indicator made from red cabbage

### Safety

Observe all safety measures regarding the handling of acids as printed on the labels! Wear your safety goggles!

### Procedure

Fill each test tube up to about a third of its volume with the solutions to be analysed and add several drops of indicator.

Fill the fermentation locks with the calcium hydroxide solution.

Add several pieces of marble (or limestone) to each solution (to a heigth of about 1 cm) and close the test tubes quickly with the prepared fermentation locks.

After a few minutes, remove several drops of each test tube using the glas stirring rod and collect them on the spoon. With the spoon, slowly let the liquid evaporate over the gas burner.

### Disposal

After diluting, pour the solutions down the sink.

11 Source (adapted from):

<http://sinus-transfer.uni-bayreuth.de/fileadmin/MaterialienBT/Skript_Flint.pdf>

## 2.4.3 Reaction between acids and metals12

### Apparatus and materials

4 large and 1 small test tubes for each acidic solution to be analysed

matching pierced stoppers with a short tube inserted

stand for test tubes

watch glass

crucible tongs

glass stirring rod

spoon

gas burner

various acidic solutions to be analysed

magnesium (e.g.pencil sharpener)

zink (e.g. zinc-plated roofing nails, zinc granules or pieces of a zinc roof gutter)

iron (e.g. iron nails, iron wool)

copper (e.g. copper wire)

indicator

### Safety

Observe all safety measures regarding the handling of acids as printed on the labels! Wear your safety goggles!

### Procedure

Fill each of the 4 large test tubes up to about two thirds of its volume with the solutions to be analysed and add several drops of indicator.

Add one piece of metal to the first test tube and close the test tube with the pierced stopper with a short tube inserted.

Collect the gas that is generated with a small test tube and perform the test for hydrogen/oxygen gas.

Proceed accordingly with the other pieces of metal.

After the reaction subsides, remove several drops of each test tube using the glas stirring rod and collect them on the spoon. With the spoon, slowly let the liquid evaporate over the gas burner.

### Diposal

After diluting, pour the solutions down the sink. Put the solids in the waste bin.

12 Source (adapted from):

<http://sinus-transfer.uni-bayreuth.de/fileadmin/MaterialienBT/Skript_Flint.pdf>

## 2.4.4 Reaction between acid and organic substances13

### Apparatus and materials

1 test tube for each acidic solution to be analyzed

stand for test tubes

spatula

tweezers

paper towels

various acidic solutions to be analysed (about 10 ml each)

several small pieces of raw meat or egg white

### Safety

Observe all safety measures regarding the handling of acids as printed on the labels! Wear your safety goggles!

### Procedure

Fill each test tube up to about a third of its volume with the solutions to be analysed and add a piece of raw meat to each.

Leave the test tube sit for several days, renewing the solution every day.

Remove the solutions after several days and put the solid remains on a paper towel. Analyse the consistency of the remains by pushing down on them with a spatula.

### Disposal

After diluting, pour the solutions down the sink. Put the solids in the waste bin.

13 Source (adapted from):

<http://sinus-transfer.uni-bayreuth.de/fileadmin/MaterialienBT/Skript_Flint.pdf>

## 2.4.5. “Getting rid” of acids

1. Knowing how much acid is in a particular household product, is it ok for the environment to simply have this acidic solution go down the drain? Search for information on what industry does before disposing of acidic solutions, if any.

2. Research also, which options you have in the chemistry lab to make solutions less acidic. Discuss your findings and come up with an experiment to decrease the acidity of a vinegar solution.